

CLAIMS

1. A flat tube comprising an upper wall, a lower wall, a right and a left side wall interconnecting the upper and lower walls at respective right and left side edges thereof, and a plurality of reinforcing walls interconnecting the upper and lower walls, extending longitudinally of the tube and spaced apart from one another as positioned between the right and left side walls, the tube having parallel fluid channels formed inside thereof, each of the reinforcing walls having communication holes for holding the adjacent fluid channels in communication with each other therethrough, each of the reinforcing walls being formed from a downward ridge projecting downward from the upper wall integrally therewith and an upward ridge projecting upward from the lower wall integrally therewith by brazing the two ridges to each other, only one of the downward ridge and the upward ridge forming the reinforcing wall being provided with a plurality of cutouts arranged at a spacing longitudinally of the ridge, the cutouts having openings closed with the other ridge having no cutouts to thereby form the communication holes.

2. A flat tube according to claim 1 which satisfies the relationships of $H \leq 1.4$ mm, $h_1 \leq 0.7$ mm and $h_2 \leq 0.7$ mm wherein H is the height of the reinforcing wall, and h_1 and h_2 are the height of the downward ridge and the height of the upward ridge, respectively.

3. A flat tube according to claim 2 which satisfies the

relationships of $0.4 \text{ mm} \leq H \leq 1.2 \text{ mm}$, $0.2 \text{ mm} \leq h_1 \leq 0.6 \text{ mm}$ and $0.2 \text{ mm} \leq h_2 \leq 0.6 \text{ mm}$.

4. A flat tube according to claim 1 wherein reinforcing walls having cutouts formed in the downward ridge and reinforcing walls having cutouts formed in the upward ridge are arranged alternately.

5. A flat tube according to claim 1 the communication holes formed in all reinforcing walls are in a staggered arrangement when seen from above.

10 6. A flat tube according to claim 1 which is 10 to 40% in opening ratio which is the ratio of all the communication holes in each reinforcing wall.

7. A flat tube according to claim 1 which is formed by bending a single metal plate at a midportion of width thereof and brazing opposite side edges thereof to each other so as to form a hollow portion.

15 8. A flat tube according to claim 7 which is fabricated from a metal plate comprising a first portion and a second portion for forming the upper wall and the lower wall respectively which portions are made integral with each other by a joint portion, a third portion integral respectively with each of the first portion and the second portion and projecting upward from a side edge thereof opposite to the joint portion for forming one of the side walls, and a plurality of ridges projecting from each of the first portion and the second portion integrally therewith in the same direction as the third portion, by bending

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the metal plate at the joint portion to the shape of a hair pin, forming the upper and lower walls by the first portion and the second portion, forming the other side wall by the joint portion, forming said one side wall by brazing the third portions to each other end-to-end, and forming the reinforcing walls by brazing the ridges on one of the first and second portions to the respective ridges of the other of the first and second portions end-to-end.

9. A flat tube according to claim 8 wherein the metal plate is formed by rolling an aluminum brazing sheet, and the third portions and the ridges are formed on the surface of a brazing material of the brazing sheet integrally therewith.

10. A flat tube according to claim 1 which is formed by brazing a platelike upper component member of metal and a platelike lower component member of metal to each other in combination so as to form a hollow portion.

11. A flat tube according to claim 10 wherein the upper component member has a first portion for forming the upper wall, second portions projecting downward from respective opposite side edges of the first portion integrally therewith for forming the side walls and a plurality of downward ridges projecting downward from the first portion integrally therewith, and the lower component member has a third portion for forming the lower wall, fourth portions projecting upward from respective opposite side edges of the third portion integrally therewith for forming the side walls and a plurality of upward ridges

projecting upward from the third portion integrally therewith, the upper and lower walls being formed respectively by the first portion and the third portion, each side wall being formed by brazing the second portion to the fourth portion, the
5 reinforcing walls being formed by brazing the downward ridges to the upward ridges end-to-end.

12. A flat tube according to claim 11 wherein the upper component member and the lower component member are each formed by rolling an aluminum brazing sheet, and the second portions
10 and the downward ridges, and the fourth portions and the upward ridges are formed on the surface of a brazing material of the brazing sheet integrally therewith.

13. A heat exchanger comprising a pair of headers arranged in parallel and spaced apart from each other, a plurality of
15 parallel heat exchange tubes each comprising a flat tube according to any one of claims 1 to 12 and each joined at opposite ends thereof to the two headers, fins each disposed in an air flow clearance between the adjacent heat exchange tubes and brazed to the adjacent tubes,

20 14. A process for producing a heat exchanger characterized by preparing a metal plate comprising a first portion and a second portion for forming an upper wall and a lower wall respectively which portions are made integral with each other by a joint portion, a third portion integral respectively with
25 each of the first portion and the second portion and projecting upward from a side edge thereof opposite to the joint portion

for forming a side wall, and a plurality of ridges projecting from each of the first portion and the second portion integrally therewith in the same direction as the third portion and arranged widthwise of the metal plate at a spacing, the ridges of the first portion and the ridges of the second portion being positioned symmetrically about a center line of the metal plate with respect to the widthwise direction thereof; forming a plurality of cutouts in only one of the two ridges in each pair which are positioned symmetrically about the center line with respect to the widthwise direction, at a spacing longitudinally of the ridge; preparing a plurality of tacked bodies each by bending the metal plate to the shape of a hairpin at the joint portion to position the third portions end-to-end and the ridges end-to-end and temporarily holding the metal plate in the bent state; preparing a pair of headers each having tacked body inserting holes in the same number as the tacked bodies and a plurality of fins; arranging the pair of headers as spaced apart and arranging the tacked bodies and the fins alternately; inserting opposite ends of the tacked bodies into the holes of the headers; and simultaneously brazing the butting third portions of each tacked body to each other, the butting ridges in each pair of each tacked body to each other, the tacked bodies to the headers, and each fin to the tacked bodies adjacent thereto.

15. A process for producing a heat exchanger according to claim 14 wherein ridges having the cutouts and ridges having

no cutouts are provided alternately on the first portion of the metal plate, and ridges having the cutouts and ridges having no cutouts are provided alternately on the second portion of the metal plate.

- 5 16. A process for producing a heat exchanger characterized by preparing an upper component member having a first portion for forming an upper wall, second portions projecting downward from respective opposite side edges of the first portion integrally therewith for forming side walls and a plurality
10 of downward ridges projecting downward from the first portion integrally therewith and arranged widthwise of the member at a spacing, and a lower component member having a third portion for forming a lower wall, fourth portions projecting upward from respective opposite side edges of the third portion
15 integrally therewith for forming the side walls and a plurality of upward ridges projecting upward from the third portion integrally therewith and arranged widthwise of the lower component member at a spacing; forming a plurality of cutouts in only one of the downward ridge of the upper component member
20 and the upward ridge of the lower component member positioned in corresponding relation with the downward ridge in each pair, the cutouts being arranged at a spacing longitudinally of the ridge; preparing a plurality of tacked bodies each by fitting the upper and lower component members to each other with each
25 of the second portions positioned in combination with the corresponding fourth portion and with the downward ridges and

the upward ridges positioned end-to-end and temporarily holding the members as fitted to each other; preparing a pair of headers each having tacked body inserting holes in the same number as the tacked bodies and a plurality of fins; arranging the pair of headers as spaced apart and arranging the tacked bodies and the fins alternately; inserting opposite ends of the tacked bodies into the holes of the headers; and simultaneously brazing each second portion of each tacked body to the corresponding fourth portion thereof, the downward ridges of each tacked body to the upward ridges thereof, the tacked bodies to the headers, and each fin to the tacked bodies adjacent thereto.

17. A process for producing a heat exchanger according to claim 16 wherein downward ridges having the cutouts and downward ridges having no cutouts are provided alternately on the first portion of the upper component member, and upward ridges having the cutouts and upward ridges having no cutouts are similarly provided alternately on the third portion of the lower component member.

18. A vehicle comprising a refrigeration cycle having a compressor, a condenser and an evaporator, the condenser being a heat exchanger according to claim 13.